THE THIRD DIMENSION OF PRINTING TECHNOLOGY USING 3DIMENTIONAL MODEL

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Abstract: 3D printing technology refers to fabrication of a tangible object from a digital file by using 3D printer. 3Dprinting platform is high-resolution, low cost, and extensible. Using a machine is creating 3D object out of thin air.Well, not exactly thin air. They use everything from metals to ceramic powder. But the process does seem like magic. Its merit noting that 3D printing goes by a number of different names, including: rapid prototyping, direct manufacturing, and additive manufacturing and solid freeform fabrication. Here select to use the term 3D printing, but they all mean approximately the same thing.

Keywords: *Steriolithography Apparatus (SLA), Maya, Google Sketch up, 3D Tin, Photopolymer objects, Rapid printing.*

1. INTRODUCTION

Chuck Hull is the inventor of the solid imaging process known as Steriolithography (3D printing), the first commercial Rapid prototyping technology, and the STL file format.

3D is an inexact name, but usually refers to object made using ink jet technology in three dimensions. As its name involves it is a very near cousin to traditional 2D printing. These types of printers work in layering powder a powder substrate and binding it with pigmented glue. This is the only 3D printing technology capable of printing in full colour. The major manufacturer of 3D printing equipment is **Zcorp**. A process for making a physical object from a three-dimensional digital model, typically by laying down many successive thin layers of a material is 3D printing.

How 3D printing works?

Most people are familiar with the inkjet or laser printers that produce most of today's documents or photographs. The 3D printing technology varies with its printer type, printing material.. As its manufacturers are using variety of technologies to meet their needs, the 3D printing technology has its basic principles. The first step of the 3D printing is started from a 3D model created using CAD (Computer Aided Design) software or a 3D scanner. The commonly used CAD soft wares like AutoCAD, 3D Tin, 3D craft, Blender, Maya, Google Sketch up, are used to develop 3D model. The next step is to save the 3D model created to a 3D printer supportable format. The commonly used 3D Printer format is Standard Tessellation Language (TSL) developed in 3D Systems .We perform custom settings for 3D printing as in 2D printing and correct the size, orientation like as settings in a 3D printer. Then it contains fill up the printing material, adjust the tray that perform as foundation of the 3D object and filling the supporting material. After that includes the printing process, this process is completed automatically, based on the size, print type and printing material. The printing process will take several hours or few days. The layers that are deposited during the printing have 0.1mm thickness on an average. After completing the 3D printing the objects is removed from the tray and applies some post processing. Thus a model that is born in the virtual world will become a part of the real world.

2. 3D PRINTING METHODS

The 3D printing methods are selected by using the common factors like materials used, number of colours, Resolution, expense and the technologies are divided five steps. There are given below:-

- Steriolithography(SLA)
- Selective Laser Sintering(SLS)
- Fused Deposition Modelling(FDM)
- Direct 3D printing
- Binder 3D printing

Simply 3D Printing is the process that converts a Digital formatted image into an original 3D object. Elaborating, the 3D printing is also one type of process that process to develop a real world object with help of CAD software or 3D scanner that is used to scan a 3D object in 3 Dimensions the objects used to create 3D model is wax, plastic, metal, glass etc.., traditionally construction can be done by substractive developed technology but in 3D printing the printing process is completed by additive manufacturing technology, that is the model of the object to be created and divided into layers and the printing material is deposit into layer by layer to create the desired 3D objective. In substractive manufacturing the process can be done by changing the raw material by using drilling and cutting process and eliminate unwanted parts to create the object just like the stone into a statue.

3. STERIOLITHOGRAPHY

The first 3D printer available in the market is work based on the technology 'Steriolithography', and the 3D printer is known as Steriolithography Apparatus (SLA).It is initially developed 3D printing technology. In this technique the liquid state photopolymer object (Commonly liquid Resin) is applied for printing material, this liquid photopolymer object is stiffened by the laser lights and consequently the object is created. The major parts of a steriolithograpic machine are a tank which is filled with liquid photopolymer, a tray or a platform bearing holes in its surface, ultraviolet laser, and computer is used to manage the laser movements and the tray. The photopolymer objects are sensitive to the UV lights and they change its liquid state to solid state at the occurrence of the ultra violet lights.

The first step is divided the 3D model deloped by the CAD program into thin layers of 5-10 layers/millimetre. Dip the tray into the tank by a layer, at the surface of the tray, the photopolymer object is traced by the UV laser to create the layer, the positions where the UV rays are strike goes stiffened. This process is continued after stepping down the tray by a layer at every process the layers are stiffened and joined to the previous layer. The stepping down process is done by the help of an elevatot. Normally the tray is down by the thickness of the layer i.e., 0.05-0.15mm; the process is automatically done until the object is created. After the printing process is completed, the additionally used polymer part is removed and undergoes a chemical bathing, then it is put into the UV Oven to increase the hardness. Usually supporting structures are used to stretch the object into the ray; it will also remove after the printing process.

Due to the size and the complexity of the object the printing process is long for a few hours to a few days. We can make the 50 X 50 X 60 cm size objects are using Steriolithography Apparatus. The major issues of the object are its overhead cost. The liquid costs $80-$210/litre and the machine costs $100,000-$500,000.

4. SELECTIVE LASER SINTERING

Printing method using, the solid objects are created from the powder like materials. The processing method the materials like metal, plastic, ceramic, glass can be used. Using Carbon dioxide laser, the material is merged and bind together to develop the object. The cross section of the 3D model is scanned and select to fuse the powder material to create the object. As only the chosen portion undergoes fusion so the other portions perform as the supporting structure, it makes the SLS more advanced than SLA. Today's SLS machines are expensive, with some costing as much as $250,000.

5. FUSED DEPOSITION MODELLING

Objects created with an FDM printing start out as computer-aided design (CAD) files. Before an object can be printed, its CAD file must be exchanged to a format that a 3D printer can understand normally as ***.STL*** format**.**

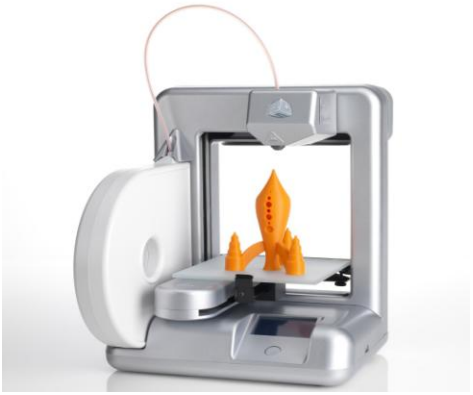
Fused deposition modelling printers use two kinds of materials, a modelling material, which constitutes the finished object, and a support material, that perform as a scaffolding to maintain the object as its being printed. During printing, these materials take the form of plastic threads, or filaments, that are unwound from a coil and feed through an extrusion nozzle. The nozzle melts the

filaments and extrudes them onto a base, sometimes called a build platform or table. Both the nozzle and the support for controlled by a computer that translates the dimensions of an object into X, Y and Z coordinates for the nozzle and base to follow during printing.

In a typical FDM system, the extrusion nozzle moves over the build platform horizontally and vertically, "drawing" a cross section of an object onto the platform. This thin layer of plastic cools and hardens, instantly binding to the layer lower it. Once a layer is completed, the base is lowered usually by about one-sixteenth of an inch to make room for the next layer of plastic.

Printing time depends on the size of the object being manufactured. Small objects and thin objects print quickly, while larger, more geometrically complex objects take longer to print. Compared to other 3D printing methods, creates wax prototypes quickly with dozens of nozzles working simultaneously, like as Steriolithography (SLA) or Selective Laser Sintering (SLS), FDM is a fairly slow process.

If an object comes off the FDM printer, its maintain materials are removed by soaking the object in a water and detergent solution or, in the case of thermoplastic supports, snapping the support material off by hand. Objects can also be milled, sanded, painted or plated to improve their function and appearance. ***FDM printers cost $1,299. MakerBot's machines are even more expensive, ranging in price from $2,549 to $3,299. And Stratasys' Mojo costs just under $10,000.***



CUBE 3D PRINTER

6. DIRECT AND BINDER 3-D PRINTING

One approach to 3-D printing is direct 3-D printing. Direct 3-D printing uses inkjettechnology, that available for 2-D printing since the 1960s. Similar to a 2-D inkjet printer, nozzles in a 3-D printer move back and forwards dispensing a fluid. Unlike 2-D printing, though, the nozzles or the printing surface move up and down so multiple layers of material over the same surface. Additionally, these printers not using ink; they dispense thick waxes and plastic polymers that solidify to form each new cross-section of the sturdy 3-D object. Rapid Prototyping (RP) has been a main thing in the growth of direct 3-D printing. In 1994, the Model Maker, a machine produced by a company is called as Solidscape, became the first commercially successful method to use the inkjet approach to Rapid Prototyping. Other commercial RP products have followed, and all of them apply waxy compounds. e.g., today's advanced rapid prototyping products use technologies like as Multi-Jet Modelling (MJM), which Binder 3-D printing, like direct 3-D printing, uses inkjet nozzles to affect a liquid and form every new layer. Unlike direct printing though binder printing applies two separate materials that come together to form every printed layer: a fine dry powder plus a liquid glue, or binder. Binder 3-D printers create two passes to form every layer. The first pass rolls out a thin coating of the powder, and the second pass applies the nozzles to applying the binder. The building platform then lowers slightly to contain a new layer of powder, and the entire process repeats until the model is finished. The company must use few combinations of powder and binder materials. Binder 3-D printing has some merits more direct 3-D printing. It tends to be faster than direct printing because less of the material is used the nozzles. The next advantage is that you can incorporate a wider variety of materials in the process, including metals and ceramics, as well as colour.

7. CONCLUSION

While traditional laser and ink-jet printers only make marks on paper, 3D printers build up solid objects many very thin layers. Already pioneers are contains 3D printing production tools, prototypes, jewellery, sunglasses, and works of art, toys and vehicle parts. But this is just the beginning.3D printing helps create a world where the products we buy have a better fit, a better match to one’s personal style, and where we all have the ability to own something that is truly unique.

For consumers, it is moving that individuals can now not only create products that better serve their own needs and interests, but start to sell the result to others like them. The impact of 3D printing will be huge in future

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